

Claims

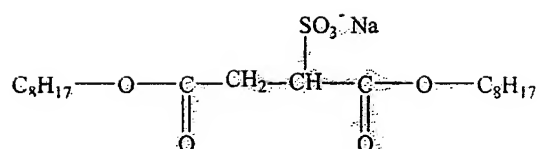
- [c1] A clearcoat composition that reduces the ability of rain to bead on a film of said clearcoat composition, said clearcoat composition comprising:
- a resin having a functional group;
 - a cross-linking agent reactive with said functional group of said resin; and
 - a water-soluble surfactant that reduces the ability of the rain to bead on the film wherein said water-soluble surfactant is of the general formula,



where R is a branched or unbranched, cyclic or non-cyclic, chain comprising carbon, oxygen, and hydrogen atoms.

[c2]

A clearcoat composition as set forth in claim 1 wherein said water-soluble surfactant is of the formula:



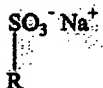
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- [c3] A clearcoat composition as set forth in claim 1 wherein said water-soluble surfactant has a water solubility of at least 0.5 grams in 100 ml of water at 25 ° C.
- [c4] A clearcoat composition as set forth in claim 1 wherein said water-soluble surfactant migrates out from the film of said clearcoat composition to lower a

surface tension of the rain relative to a surface tension of the film for reducing the ability of the rain to bead on the film.

[c5] A clearcoat composition as set forth in claim 1 wherein said water-soluble surfactant is infinitely soluble in water.

[c6] A clearcoat composition that reduces the ability of rain to bead on a film of said clearcoat composition, said clearcoat composition comprising:
a resin having a functional group;
a cross-linking agent reactive with said functional group of said resin; and
a water-soluble surfactant that reduces the ability of the rain to bead on the film.

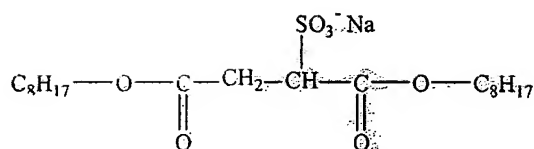
[c7] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is of the general formula:



where R is a branched or unbranched, cyclic or non-cyclic, chain comprising carbon, oxygen, and hydrogen atoms.

[c8]

A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is of the formula:



[c9] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is further defined as a sulfosuccinate.

[c10] A clearcoat composition as set forth in claim 9 wherein said sulfosuccinate is further defined as a sodium alkyl sulfosuccinate.

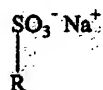
- [c11] A clearcoat composition as set forth in claim 10 wherein said sodium alkyl sulfosuccinate is further defined as sodium dioctyl sulfosuccinate.
- [c12] A clearcoat composition as set forth in claim 10 wherein said sodium alkyl sulfosuccinate is further defined as sodium bis(2-ethyhexyl) sulfosuccinate.
- [c13] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant has a water solubility of at least 0.5 grams in 100 ml of water at 25 ° C.
- [c14] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is infinitely soluble in water.
- [c15] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is further defined as an anionic surfactant.
- [c16] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is further defined as a liquid surfactant.
- [c17] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is present in an amount from 0.01 to 5 parts by weight based on 100 parts by weight of said clearcoat composition.
- [c18] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant is in combination with a solvent.
- [c19] A clearcoat composition as set forth in claim 18 wherein said solvent is selected from the group consisting of water, glycol, isopropyl alcohol, ethanol, propylene glycol, polyethylene glycol, mineral spirits, and combinations thereof.
- [c20] A clearcoat composition as set forth in claim 6 wherein said resin is selected from the group consisting of acrylic resins, polyester resins, polyurethane resins, epoxy resins, phenolic resins, carbamate resins, and combinations thereof.
- [c21] A clearcoat composition as set forth in claim 6 wherein said resin is present in an amount from 3 to 95 parts by weight based on 100 parts by weight of said clearcoat composition.

- [c22] A clearcoat composition as set forth in claim 6 wherein said cross-linking agent is selected from the group consisting of aminoplasts, isocyanates, polycarboxylic acids, acid anhydrides, polyamines, polyphenols, epoxy resins, and combinations thereof.
- [c23] A clearcoat composition as set forth in claim 6 wherein said cross-linking agent is present in an amount from 3 to 50 parts by weight based on 100 parts by weight of said clearcoat composition.
- [c24] A clearcoat composition as set forth in claim 6 having a resistance to etch from the rain that is improved by from 5 to 25%.
- [c25] A clearcoat composition as set forth in claim 6 wherein said clearcoat composition is a thermosetting clearcoat composition such that the film provided by said thermosetting clearcoat composition is a cured film.
- [c26] A clearcoat composition as set forth in claim 6 wherein said clearcoat composition is a thermoplastic clearcoat composition such that the film provided by said thermoplastic clearcoat composition is a thermoplastically-set film.
- [c27] A cured film formed by said thermosetting clearcoat composition of claim 25.
- [c28] A substrate having the cured film formed by said thermosetting clearcoat composition of claim 25.
- [c29] A clearcoat composition as set forth in claim 6 wherein said water-soluble surfactant migrates out from the film of said clearcoat composition to lower a surface tension of the rain relative to a surface tension of the film for reducing the ability of the rain to bead on the film.
- [c30] A method of reducing the ability of rain to bead on a film of a clearcoat composition, wherein the clearcoat composition comprises a resin having a functional group, a cross-linking agent reactive with the functional group of the resin, and a water-soluble surfactant and said method comprises the steps of: providing the resin; incorporating the cross-linking agent with the resin to form an intermediate

composition; and

incorporating the water-soluble surfactant into the intermediate composition to form the clearcoat composition such that, upon exposure to the rain, the water-soluble surfactant reduces the ability of the rain to bead on the film.

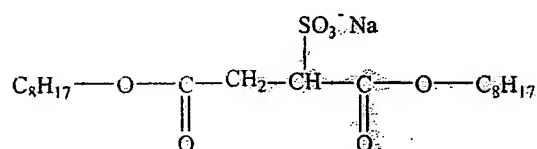
- [c31] A method as set forth in claim 30 wherein the step of incorporating the water-soluble surfactant is further defined as incorporating a water-soluble surfactant of the general formula:



where R is a branched or unbranched, cyclic or non-cyclic, chain comprising carbon, oxygen, and hydrogen atoms.

- [c32]

A method as set forth in claim 30 wherein the step of incorporating the water-soluble surfactant is further defined as incorporating a water-soluble surfactant of the formula:



[c33] A method as set forth in claim 30 wherein the step of incorporating the water-soluble surfactant is further defined as incorporating a sulfosuccinate into the intermediate composition to form the clearcoat composition.

[c34] A method as set forth in claim 33 wherein the step of incorporating the sulfosuccinate is further defined as incorporating a sodium alkyl sulfosuccinate

into the intermediate composition to form the clearcoat composition.

- [c35] A method as set forth in claim 34 wherein the step of incorporating the sodium alkyl sulfosuccinate is further defined as incorporating sodium dioctyl sulfosuccinate into the intermediate composition to form the clearcoat composition.
- [c36] A method as set forth in claim 34 wherein the step of incorporating the sodium alkyl sulfosuccinate is further defined as incorporating sodium bis(2-ethylhexyl) sulfosuccinate into the intermediate composition to form the clearcoat composition.
- [c37] A method as set forth in claim 30 wherein the step of incorporating the water-soluble surfactant is further defined as incorporating from 0.01 to 5 parts by weight of the water-soluble surfactant based on 100 parts by weight of the clearcoat composition.
- [c38] A method as set forth in claim 30 further comprising the step of combining the water-soluble surfactant with a solvent prior to incorporation of the water-soluble surfactant into the intermediate composition.
- [c39] A method as set forth in claim 38 wherein the step of combining the water-soluble surfactant with the solvent is further defined as combining the water-soluble surfactant with a solvent selected from the group consisting of water, glycol, isopropyl alcohol, ethanol, propylene glycol, polyethylene glycol, mineral spirits, and combinations thereof, prior to incorporation of the water-soluble surfactant into the intermediate composition.
- [c40] A method as set forth in claim 30 wherein the step of providing the resin is further defined as providing a resin selected from the group consisting of acrylic resins, polyester resins, polyurethane resins, epoxy resins, phenolic resins, carbamate resins, and combinations thereof.
- [c41] A method as set forth in claim 30 wherein the step of providing the resin is further defined as providing from 3 to 95 parts by weight of the resin based on 100 parts by weight of the clearcoat composition.

- [c42] A method as set forth in claim 30 wherein the step incorporating the cross-linking agent with the resin is further defined as incorporating a cross-linking agent selected from the group consisting of aminoplasts, isocyanates, polycarboxylic acids, acid anhydrides, polyamines, polyphenols, epoxy resins, and combinations thereof, to form the intermediate composition.
- [c43] A method as set forth in claim 30 wherein the step of incorporating the cross-linking agent with the resin is further defined as incorporating from 3 to 50 parts by weight of the cross-linking agent based on 100 parts by weight of the clearcoat composition.
- [c44] A method as set forth in claim 30 wherein the step of incorporating the water-soluble surfactant is further defined as incorporating a water-soluble surfactant having a water solubility of at least 0.5 grams in 100 ml of water at 25 ° C into the intermediate composition to form the clearcoat composition.
- [c45] A method as set forth in claim 30 wherein the step of incorporating the water-soluble surfactant is further defined as incorporating a water-soluble surfactant that is infinitely soluble in water into the intermediate composition to form the clearcoat composition.
- [c46] A method as set forth in claim 30 wherein the step of incorporating the water-soluble surfactant is further defined as incorporating a water-soluble surfactant into the intermediate composition that migrates out from the film of the clearcoat composition to lower a surface tension of the rain relative to a surface tension of the film.